

REMARKS

By this response, Claim 39 has been amended. Claims 25 and 28-45 are pending in the application.

Reconsideration, reexamination and allowance are respectfully requested in view of the following remarks.

First Rejection Under 35 U.S.C. § 103

Claims 25, 29, 33, 34, 37, 38, 42 and 45 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,685,942 to Ishii ("Ishii") in view of U.S. Patent No. 5,772,771 to Li et al. ("Li") and U.S. Patent No. 6,132,512 to Horie et al. ("Horie"). The reasons for the rejection are stated on pages 2-5 of the Official Action. The rejection is respectfully traversed.

Claim 25 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, a "gas injector body of dielectric material" and including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body and include only a single gas outlet extending in the axial direction, and the gas outlets are sized to inject the process gas at a subsonic, sonic or supersonic velocity" (emphasis added). The gas injector recited in Claim 25 is not suggested by the applied references.

Claim 25 recites a "gas injector body of dielectric material." For the Examiner's information, Applicants have attached a copy of page 386 of The American Heritage College Dictionary, third ed., Houghton Mifflin (2000), at which a ✓

“dielectric” is defined as “a nonconductor of electricity, esp. a substance with electrical conductivity less than a millionth (10^{-6}) of a siemens” (emphasis added).

The Official Action refers to Fig. 4 of Ishii and asserts that the illustrated “conductor gas injector” 85 (i.e., ground electrode 85) comprises a “gas injector body” 85 sized to extend through the chamber wall 83 of a processing chamber. The Official Action further asserts that the gas injector body includes an axial planar distal end surface exposed within the processing chamber and gas outlets located in the axial distal end surface.

The Official Action admits that Ishii does not teach a dielectric gas injector body, but asserts that “Ishii teaches alternative materials to conductive, non-dielectric, electrodes which are dielectric semiconductors such as the same materials as that of the processed semiconductor (‘quartz’) wafer (column 4; lines 43-51).”

Dielectric, semiconductor and conductive materials are well known in the art of semiconductor plasma processing as separate categories of materials that can be characterized by their distinct electrical properties. Particularly, dielectric materials are electrical insulators, and semiconductor materials have electrical conductivity properties intermediate to those of insulators and conductors.

Ishii’s ground electrode 85 shown in FIG. 4 is a showerhead electrode (column 7, line 65 – column 8, line 1). As such, the ground electrode 85 is necessarily made of an electrically conductive material. In other words, the ground electrode 85 cannot be of a dielectric material and still be operable for its intended purpose. However, as explained at MPEP § 2143.01, page 2100-131, “[i]f the proposed modification would render the prior art invention being modified

unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification" (citation omitted). Accordingly, there is no motivation to make Ishii's ground electrode of a dielectric material.

At column 4, lines 43-51, Ishii discloses materials for the ground electrode 31. Ishii discloses that the electrode is made of a conductor or a semiconductor. Ishii does not disclose that the ground electrode is of a dielectric material. Ishii discloses that the ground electrode can be made of the same material as that of the processing housing 2, i.e., aluminum, which has high electrical conductivity. Ishii also discloses that "Si single crystal, SiC or C, which are the same material as that of the semiconductor wafer, can also be used as a material to prevent heavy metal contamination." However these materials are not dielectric materials.

Ishii does not use the term "dielectric semiconductor" mentioned in the Official Action. Nor has the Official Action cited any reference that defines the meaning of this term. The Official Action refers to a "semiconductor ('quartz') wafer." However, quartz is a dielectric material. Consistent with this fact, Ishii does not disclose quartz in the specific disclosed group of materials (i.e., silicon, SiC and C) for the ground electrode. In fact, Ishii teaches away from making the ground electrode of a dielectric material.

At page 4, next-to-last paragraph of the Official Action, it is stated that it would have been obvious to "use alternative conductor materials for Ishii's conductor gas injector" (emphasis added). As such, the Official Action acknowledges that Ishii's ground electrode is not of a dielectric material, as recited in Claim 25, but is comprised of a conductor or semiconductor.

In addition, Li and Horie provide no suggestion or motivation to modify Ishii's ground electrode 85 to produce the gas injector recited in Claim 25. Li discloses a deposition chamber 2 including a nozzle 56. As shown in FIG. 1A, the nozzle 56 includes three separate nozzles 56a each having an orifice at its distal end.

Li provides no motivation to make Ishii's ground electrode 85 from a dielectric material, which would destroy the function for which the electrode is provided.

Horie also fails to cure the deficiencies of Ishii with respect to the gas injector recited in Claim 25. The Official Action refers to FIGs. 18A, 18B of Horie and asserts that Horie discloses a "gas distribution plate" 64. Applicant submits that Horie also provides no motivation to convert Ishii's electrode into a dielectric material and thus destroy the electrode's function. Thus, the gas injector recited in Claim 25 is patentable over the applied references.

Dependent Claims 29, 33, 34, 37, 38 and 45 are also are patentable for at least the same reasons as those discussed for Claim 25.

Claim 42 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises "gas injector body made of a dielectric material selected from the group consisting of quartz, alumina and silicon nitride and sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body and the gas outlets being sized to inject the process gas at a sonic or supersonic velocity" (emphasis added).

As discussed above, Ishii would be inoperable if the ground electrode 85 were made of a dielectric material, much less of quartz, alumina or silicon nitride, as claimed. Thus, Ishii does not suggest the gas injector recited in Claim 42.

In addition, neither Li nor Horie provides any suggestion or motivation to modify Ishii's ground electrode 85 to make it of a dielectric material.

Therefore, withdrawal of the rejection is respectfully requested.

Second Rejection Under 35 U.S.C. § 103

Claims 28, 30-32, 35, 36, 39, 40, 43 and 44 stand rejected under 35 U.S.C. § 103(a) over Ishii, Li, Horie and U.S. Patent No. 6,077,357 to Rossman et al ("Rossman"). The reasons for the rejection are stated on pages 5-7 of the Official Action. The rejection is respectfully traversed.

Claims 28, 30-32, 35, 36, 43 and 44 depend from Claim 25. Rossman fails to cure the deficiencies of Ishii's ground electrode 85 with respect to the gas injector recited in Claim 25. The Official Action asserts that Rossman discloses a gas injection nozzle 302 including a first O-ring seal 326 and a second O-ring seal 322, 324. However, Rossman also provides no motivation to convert Ishii's electrode into a dielectric material and thus destroy its intended function. Accordingly, dependent Claims 28, 30-32, 35, 36, 43 and 44 are also patentable for at least the same reasons as those discussed for Claim 25.

Independent Claim 39, as amended, recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, "a gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber and a cylindrical bore adapted to supply gas to the gas

outlets, the cylindrical bore being defined by a sidewall and an endwall which extends radially inwardly from the sidewall, the gas outlets including a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction, wherein the gas outlets are located in the axial distal end surface of the gas injector body” (emphasis added).

For the Examiner's convenience, Applicants have attached Exhibit A, which shows FIG. 3A of the present application and FIG. 4 of Ishii. In the embodiment shown in FIG. 3A, the cylindrical central bore 44 defined by a sidewall and an endwall at the bottom end of the central bore 44. The endwall extends radially inwardly from the sidewall. A center gas outlet 46 extends from the endwall in the axial direction, and angled gas outlets 46 extend from the endwall at an acute angle to the axial direction.

Ishii's ground electrode 85 shown in FIG. 4 has a plurality of axially-extending supply ports 87 in direct fluid communication with the intermediate hollow portion 86. The hollow portion 86 is, in turn, in direct fluid communication with the cylindrical gas inlet 88a. In the ground electrode 85, the supply ports 87 are vertically separated from the cylindrical gas inlet 88a by the hollow portion 86.

The Official Action asserts that the “cylindrical bore” 88a (i.e., cylindrical gas inlet 88a) is adapted to supply gas to Ishii's “gas outlets” 87 (i.e., supply ports 87), and that the cylindrical bore 88a is defined by an “endwall,” i.e., the top surface of the hollow portion 86. However, as shown in Exhibit A, the top surface partially defines the hollow portion 86, but does not define the cylindrical bore 88a. The cylindrical bore 88a is defined completely by the “sidewall,” as shown in Exhibit A.

Moreover, the top surface of the hollow portion 86 does not extend radially inwardly from the sidewall of the cylindrical bore 88a.

Furthermore, because the gas inlet 88a is located vertically above the supply ports 87 and the hollow portion 86. The supply ports 87 cannot extend from the cylindrical gas inlet 88a. In contrast, the supply ports 87 extend from the bottom surface defining the hollow portion 86. Accordingly, Ishii does not suggest the gas injector recited in Claim 39.

Li, Horie and Rossman provide no motivation to modify Ishii's ground electrode 85 in a manner to produce the gas injector recited in Claim 39, including the features of "a cylindrical bore adapted to supply gas to the gas outlets, the bore being defined by a sidewall and an endwall which extends radially inwardly from the sidewall, the gas outlets including a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction, wherein the gas outlets are located in the axial distal end surface of the gas injector body" (emphasis added). Accordingly, the gas injector recited in Claim 39 is also patentable.

Dependent Claim 40 is also patentable for at least the same reasons as those discussed for Claim 39.

Therefore, withdrawal of the rejection is respectfully requested.

Third Rejection Under 35 U.S.C. § 103

Claim 41 is rejected under 35 U.S.C. § 103(a) over Ishii and Li in view of U.S. Patent No. 5,734,143 to Kawase et al. ("Kawase"), and further in view of Horie. The

reasons for the rejection are stated on pages 7-9 of the Official Action. The rejection is respectfully traversed.

Independent Claim 41 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, a “gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body ... , wherein the gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets, the central bore extending axially from an upper axial end face of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the flat endwall” (emphasis added). The applied references fail to suggest the gas injector recited in Claim 41 for the following reasons.

The Official Action asserts that Ishii discloses a “gas injector” 85 (i.e., ground electrode 85) including a uniform diameter “central bore” 88a (i.e., cylindrical gas inlet 88a) extending axially from an “upper axial end face” (top surface 85) of the “gas injector” 85, where the “central bore” 88a is defined by a cylindrical sidewall and a “flat endwall (bottom surface 85)”.

However, the Official Action has taken inconsistent positions in asserting that Ishii's ground electrode 85 includes a uniform diameter cylindrical gas inlet 88a, and that the uniform diameter cylindrical gas inlet 88a is defined by a cylindrical sidewall and the bottom surface of the ground electrode 85 (see Exhibit A). The cylindrical gas inlet 88a extends vertically only to the horizontal top surface that partially defines the hollow portion 86 (see Exhibit A). The cylindrical gas inlet 88a terminates at the

horizontal top surface of the hollow portion 86; thus, the cylindrical gas inlet 88a cannot extend all the way to the bottom surface of the ground electrode 85.

To the extent that the Official Action has asserted that the hollow portion 86 is also a part of the cylindrical gas inlet 88a, then the cylindrical gas inlet 88a plus the hollow portion 86 cannot have a uniform diameter, as recited in Claim 41.

Moreover, the bottom surface of Ishii's ground electrode 85 does not "extend between" the sidewall that defines the cylindrical gas inlet 88a (see Exhibit A). In contrast, the bottom surface of the ground electrode 85 is vertically separated by the hollow portion 86 from the sidewall that completely defines the cylindrical gas inlet 88a. The cylindrical gas inlet 88a is not defined by a cylindrical sidewall and "a flat endwall extending between the cylindrical sidewall." Rather, the cylindrical gas inlet 88a is completely open at its bottom end at which it expands into the hollow portion 86.

Thus, Ishii clearly does not suggest the features of "the gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets, the central bore extending axially from an upper axial end face of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the flat endwall" (emphasis added).

Li's center nozzle 56 is a different type of gas distributor than a showerhead. Moreover, Li discloses that the nozzles 56a each have a separate respective distal end with a gas injection orifice. As such, Li provides no motivation to modify Ishii's showerhead ground electrode 85 to include a "central bore being defined by a

cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the flat endwall.”

The Official Action asserts that Kawase discloses a “gas injector” (FIG. 2) including a uniform diameter central bore along axis 70 and defined by a cylindrical sidewall and a flat endwall (bottom of 11), where inlets of the gas outlets 10 are located on the flat endwall. The Official Action asserts that it would have been obvious to replace Ishii’s “injector body” with Kawase’s “injector body.” Applicants respectfully disagree with these assertions.

The dielectric plate 11 shown in FIG. 2 of Kawase includes a bore extending through its entire thickness and having a central waveguide axis 70 for defining the propagation direction of microwaves (column 6, lines 3-7). The dielectric plate 11 also includes gas injection holes 10.

The inner conductor 5b shown in FIG. 1 has a gas inlet port 13 (column 6, line 44) extending along the axis 70. However, the gas inlet port 13 is a separate element of the plasma torch from the dielectric plate 11, and thus is not a central bore of the dielectric plate. Moreover, the inlet port 13 is not “defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the flat endwall” (emphasis added). In contrast, the bottom end of the inlet port 13 is completely open and the inlet port 13 does not include an endwall extending between the sidewall. The sidewall completely defines the inlet port 13.

Moreover, Claim 41 recites that “the gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets” (emphasis added). To the extent that the inlet port 13 has been asserted to be a “uniform diameter

central bore" as claimed, the inlet port 13 does not supply gas to the gas injection holes 10 because the gas injection holes are not in fluid communication with the inlet port 13. Applicant further notes that the bore of the dielectric plate 11 through which the inlet portion 13 extends does not have a uniform diameter and thus is also different from the claimed "uniform diameter central bore."

For at least the foregoing reasons, Kawase also provides no motivation to modify Ishii's ground electrode to result in the gas injector recited in Claim 41.

Horie also provides no motivation to modify Ishii's ground electrode to result in the combination of features recited in Claim 41.

Thus, Claim 41 is also patentable.

Therefore, withdrawal of the rejection is respectfully requested.

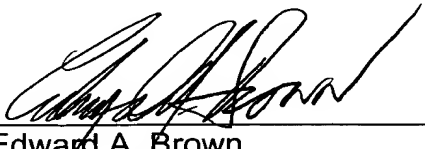
Conclusion

For the foregoing reasons, allowance of the application is respectfully requested. Should the Examiner have any questions regarding this response, Applicants' undersigned representative can be reached at the telephone number given below.

Respectfully submitted,

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Dick test

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who wrote *Letters from a Farmer in Pennsylvania* (1767-68).
Dick test *n.* A skin test used to determine immunity or susceptibility to scarlet fever. [After George Frederick Dick and Gladys Henry Dick.]

dic-y (dik'ē) *n.* Var. of *dickey*.

dic-y (dik'ē) *adj.* Informal. Impaired; faulty; weak. [?]

di-cl'i-nous (di-kli'nās) *adj.* Bot. Having stamens and pistils in separate flowers. [*di-* + Gk. *klinē*, bed, couch; see *klei-* + *-ous*.] — *di-cl'i-ny* (di'kli'nē) *n.*

di-cot'y-le-don (di'kōt'ē-dōn) also **di-cot** (di'kōt') *n.* A flowering plant having two embryonic seed leaves or cotyledons that usu. appear at germination. — *di-cot'y-le-don-ous* *adj.*

di-cro-tism (di'kra-tiz'm) *n.* A condition in which the pulse is felt as two beats per single heartbeat. [*<* Gk. *dikrotos*, double-beating: *di-*, two; see *di-* + *krotos*, rattling noise.] — *di-cro-tic* (di'krōt'ik) *adj.*

dict. *abbr.* 1. Dictation. 2. Dictionary.

dic-ta-phon (dik'tā-fōn') *n.* A trademark used for an apparatus that records and reproduces dictation for transcription.

dic-tate (dik'tāt', dik-tāt') *v.* *tat-ed, -tat-ing, -tates.* — *tr.* 1. To say or read aloud to be recorded or written by another.

2. To prescribe with authority; impose. *b.* To control or command. — *intr.* 1. To dictate material. 2. To issue orders or commands. — *n.* (dik'tāt'). 1. A directive; a command. 2. A guiding principle. [Lat. *dictāre*, freq. of *dicere*, to say. See *deik-*.]

Syns: dictate, decree, impose, ordain, prescribe. The central meaning shared by these verbs is "to set forth expressly and authoritatively": victors dictating the terms of surrender; budget cuts decreed by the legislature; impose obedience; a separation ordained by fate; taxes prescribed by law.

dic-ta-tion (dik'tā-shən) *n.* 1. *a.* The act or process of dictating material to another for transcription. *b.* The material so dictated. 2. An authoritative command or order.

dic-ta-tor (dik'tā'tor, dik-tā'-) *n.* 1. *a.* An absolute ruler. *b.* A tyrant; a despot. 2. An ancient Roman magistrate appointed temporarily to deal with an immediate crisis or emergency. 3. One who dictates: *the dictator of the letter.*

dic-ta-to-ri-al (dik'tā-tōr'ē-əl, -tōr'-) *adj.* 1. Tending to dictate; domineering. 2. Of, relating to, or characteristic of a dictator or dictatorship; autocratic. — *dic-ta-to'r'i-al-ly* *adv.* — *dic-ta-to'r'i-al-ness* *n.*

dic-ta-tor-ship (dik'tā-tor'ship', dik'tā'-) *n.* 1. The office or tenure of a dictator. 2. A state or government under dictatorial rule. 3. Absolute or despotic control or power.

dic-tion (dik'shən) *n.* 1. Choice and use of words in speech or writing. 2. Distinctness of pronunciation in speech or singing. [ME *diccion*, a saying, word *<* OFr. *<* Lat. *dictiō*, *dictiōn*, rhetorical delivery *<* *dictus*, p.p. of *dicere*, to say. See *deik-*.] — *dic-tion-al* *adj.* — *dic-tion-al-ly* *adv.*

dic-tion-ary (dik'shə-nē'rē) *n., pl. -les.* 1. A reference book containing an alphabetical list of words, with information given for each word, usu. including meaning, pronunciation, and etymology. 2. A book listing the words of a language with translations into another language. 3. A book listing words or other linguistic items in a particular category or subject with information about them: *a medical dictionary*. 4. *Comp. Sci.* A list of words stored in machine-readable form for reference, as by spelling-checking software. [Med. Lat. *dictiōnarium* *<* Lat. *dictiō*, *dictiōn*, dictation. See *dic-tion*.]

dic-tum (dik'təm) *n., pl. -ta (-tā) or -tums.* 1. An authoritative, often formal pronouncement. 2. Law. See *obiter dictum*.

1. [Lat. *<* neut. p.p. of *dicere*, to say. See *deik-*.]

dic-ty-o-some (dik'tē-ō-sōm') *n.* Bot. The Golgi apparatus in plant cells. [Gk. *diktuon*, net (*<* *dikein*, to throw; see *deik-*) + *-sōmē*.]

did (did') *v.* P.t. of *do*.

di-dact (di'dākt') *n.* A didactic person. [Back-formation *<* *didactic*.]

di-dac-tic (di-dākt'ik) also **di-dac-ti-cal** (di-dākt'ik-əl) *adj.* 1. Intended to instruct. 2. Morally instructive. 3. Inclined to teach or moralize excessively. [Gk. *didaktikos*, skillful in teaching *<* *didaktos*, taught *<* *didaskēin*, *didak-*, to teach, educate.] — *di-dac-ti-cal-ly* *adv.* — *di-dac-ti-cism* (di-dākt'ik-siz'm) *n.*

di-dac-tics (di-dākt'iks) *n.* (used with a sing. or pl. *v.*) Instruction; teaching; pedagogy.

di-dap-per (di'dāp'ər) *n.* A small grebe, such as the dabchick. [ME *didopper*, alteration of *divedap*: *<* OE *disfodoppa*, pelican: *disfan*, to dive; see *dive* + *-doppa*, a kind of bird.]

di-dle (di'dl') *v.* *-dled, -diling, -dles, tr.v.* 1. *Slang.* To cheat; swindle. 2. *Comp. Sci.* To fabricate, change, or otherwise manipulate data illegally. [Perh. akin to OE *dydrian*, to deceive, or *<* var. of dial. *doodle*, fool, simpleton; akin to LGer. *dudeldopp*.] — *di-dler* *n.*

di-dle (di'dl') *v.* *-dled, -diling, -dles.* — *tr.* 1. To jerk up and down or back and forth. 2. *Vulgar Slang.* a. To have intercourse with (a woman). *b.* To practice masturbation upon. — *intr.* 1. To shake rapidly; jiggle. 2. *Slang.* To play; fiddle. 3. *Slang.* To waste time: *diddled around all morning*. [Prob. alteration of dial. *dider*, to quiver, tremble *<* ME *dideren*, var. of *daderen*, *doderen*, perh. *<* LGer.]

di-dly (di'dl') *n.* *Slang.* A small or worthless amount. [Shan. for *diddlyshit*. See *did-dly-squat*.]

di-dly-squat (di'dl'ē-skwt') *n.* *Slang.* Diddly. [Alteration of *diddlyshit*: *diddly* (alteration of *dooodle*) + *shit*.]

Di-de-rot (dē'də-rō', dē-drō'), Denis. 1713-84. French philosopher and writer whose supreme accomplishment was his work on the *Encyclopédie* (1751-72).

di-dō (di'dō) *n.* Did not.

di-do (di'dō) *n., pl. -dos or -does.* A mischievous prank or antic; a caper. [?]

Di-do (di'dō) *n.* *Rom. Myth.* The founder and queen of Caphage, who fell in love with Aeneas and killed herself when he abandoned her.

Di-drik-son (di'drik-sən), Mildred Ella ("Babe"). Married name Zaharias. 1914-56. Amer. athlete who excelled in golf and track and won two gold medals at the 1932 Olympics.

didst (didst) *v.* *Archaic.* Second pers. sing. p.t. of *do*.

di-dym-i-um (di-dim'ē-əm) *n.* 1. *Symbol* Di A metallic mixture, once considered an element, composed of neodymium and praseodymium. 2. A mixture of rare-earth elements and oxides used chiefly in manufacturing and coloring various forms of glass. [*<* Gk. *didymos*, twin, double. See *dwo-*.]

di-dy-mous (di'di-mōs) *adj.* Arranged or occurring in pairs, twin. [*<* Gk. *didymos*, twin. See *dwo-*.]

di-dyn-a-mous (di-din'ə-mōs) *adj.* Bot. Having four stamens in two pairs of unequal length. [*<* NLat. *Didynamia*, former class name: *di-* + Gk. *dynamis*, power; see *dynamo-*.]

die (di) *intr.v.* *died, dy-ing (di'ing), dies.* 1. To cease living; become dead; expire. 2. To cease existing, esp. by degrees; fade. 3. To experience an agony or suffering suggestive of that of death. 4. *Informal.* To desire something greatly. 5. *a.* To cease operation; stop. *b.* To be destroyed, as in combat — *phrasal verbs.* *die back.* Bot. To be affected by dieback. *die down.* To lose strength; subside. *die off.* To undergo a sudden sharp decline in population. *die out.* To cease living completely; become extinct. — *Idiom.* *die hard.* To take a long time in passing out of existence. [ME *dien*, prob. *<* ON *deip*. See *dheu-*.]

die (di) *n., pl. dies or dice (dis).* 1. *pl. dies.* A device used for cutting out, forming, or stamping material, esp.: *a.* An engraved metal piece used for impressing a design onto a soft metal, as in coining money. *b.* One of several component pieces that are fitted into a diestock to cut threads on screws or bolts. *c.* A part on a machine that punches shaped holes in cuts, or forms sheet metal, cardboard, or other stock. *d.* A metal block containing small conical holes through which plastic, metal, or other ductile material is extruded or drawn. 2. *pl. dies.* *Archit.* The dado of a pedestal, esp. when cube-shaped. 3. *pl. dice.* *Games.* *a.* A small cube marked on each side with from one to six dots, usu. used in pairs in gambling and in various other games. *b. dice.* (used with a sing. *v.*) A game of chance using dice. — *tr.v.* *died, dy-ing, dies.* To cut, form, or stamp with or as if with a die. — *Idioms.* *load the dice.* 1. To make an outcome highly probable; predetermine a result. 2. To put another at a distinct disadvantage, as through prior maneuver. *the die is cast.* The decision has been made and is irrevocable. [ME *de*, gaming die *<* OFr. *<* Lat. *datum* *<* neut. p.p. of *dare*, to give. See *dō-*.]

die-back (di'bāk') *n.* Bot. The gradual dying of plant shoots, starting at the tips, caused by disease or climate.

di-e-cious (di-ē'shəs) *adj.* Bot. Var. of *dioecious*.

Die-fen-bach-er (dē'fən-bāk'ər), John George. 1895-1978. Canadian politician who served as prime minister (1957-63).
die-fen-bach-i-a (dē'fən-bāk'ē-ə, -bāk'ē-ə) *n.* Any of several plants of the genus *Dieffenbachia* native to tropical America and having jointed stems and variegated leaves. [NLat., genus name, after Ernst Dieffenbach (1811-55), German naturalist.]

die-hard also **die-hard** (di'hārd') — *adj.* Stubbornly resisting change or clinging to a seemingly hopeless or dated cause. — *n.* A diehard person. — *die-hard-ism* *n.*

die-drin (di'drīn) *n.* A chlorinated hydrocarbon, C₁₂H₁₀Cl₂O, used as an insecticide and in mothproofing. [*<* *Diels(-s) Alder(e) reaction*], after Otto Paul Hermann Diels and Kurt Alder.]

di-e-lec-tric (di'lēk'trik) *n.* A nonconductor of electricity, esp. a substance with electrical conductivity less than a millionth (10⁻⁶) of a siemens. [Di(A) + *ELECTRIC*.] — *di-e-lec-tric* *adj.* — *di-e-lec-tri-cal-ly* *adv.*

dielectric constant *n.* *Phys.* See *permittivity*.

dielectric heating *n.* The heating of electrically nonconducting materials by a rapidly varying electromagnetic field.

Diels (dēlz, dēls), Otto Paul Hermann. 1876-1954. German chemist who shared a 1950 Nobel Prize.

Di-ern (dē-ēm', dyēm'), Ngo Dinh. 1901-63. Vietnamese politician who was president of South Vietnam (1954-63).

Di-en Bien Phu (dyēn' biyēn' fō'), a town of NW Vietnam near the Laos border; site of a French military base that fell to Vietnam troops on May 7, 1954, after a 56-day siege.

di-en-ceph-a-lon (di'ēn-sēf'ə-lōn', -lōn) *n.* The posterior part of the brain that connects the mesencephalon with the cerebral hemispheres, encloses the third ventricle, and con-

tains the thalamus and hypothalamus.

di-en-ce-phal'ic (di-ēn-sēf'ik) *adj.*

die-off (di'ōf', -ōf') *n.* The elimination, or community of plants or animals.

Di-eppe (dē-ēp', dyēp'). A city of N Channel N of Rouen; site of a disaster (Aug. 19, 1942). Pop. 35,957.

di-e-r-e-sis or **di-aer-e-sis** (di-ēr'ē-sis) *n.* 1. *Ling.* *a.* A mark (') placed over the vowels to indicate that they are to be sounded rather than a diphthong, as *quar-ter* over a vowel, such as the *i* indicate that the vowel is not silent.

2. *a.* A pause in a line of verse when the end of a metric foot coincide. [LLat. *diasterein*, to divide: *dia-*, apart; see *di-*.]

die-sel (dē'zəl, -səl) *n.* 1. A diesel engine by a diesel engine.

Die-sel (dē'zəl), Rudolf. 1858-1913. German engineer who devised and patented (1892) an internal-combustion diesel engine. *n.* An internal-combustion engine that uses heat of highly compressed air to ignite fuel after the compression stroke.

die-sink-er (di' sīng'kər) *n.* One that dies for stamping or shaping. — *die-sink-er* *adj.*

Di-es-i-rae (dē'ās ir'ā') *n.* A medieval judgment day, used in some masses.

Dies irae, day of wrath (the first w. of *dies*, day + Lat. *irae*, genitive of *ira*, anger).

di-e-sis (di'ē-sis) *n., pl. -ses (-sez').* 1. [Med. Lat., semitone (shown by a quarter tone *<* Gk. *diesis*, letting through: *dia-*, *hiemi*, to see).

die-stock (di'stōk') *n.* An apparatus used for threading on screws, bolts, pipes, etc.

di-es-trus (di-ēs'trəs) also **di-es-tru-** *n.* A period of the estrous cycle.

di-estrous *adj.*

di-et (di'it) *n.* 1. The usual food of an animal. 2. A regulated selection of food.

di-et-ic (di'it'ik) *adj.* 1. Of or pertaining to diet. 2. Of or pertaining to a diet of detective novels. — *v.* *-et-ic* *adj.*

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